THE AMERICAN
JOURNAL OF PHARMACY

MARCH, 1906.

PROFESSOR JOHN ATTFIELD, F.R.S.

A BIOGRAPHICAL SKETCH.

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In the following short biographical sketch, written at the request of the editor, an attempt is made to outline the career of one who for over forty years has taken a leading part in the efforts that have been made to promote the advancement of pharmacy. To an American audience no apology is needed for bringing to their notice the name of John Attfield, an Englishman, who was paid the great compliments of being elected in 1869 a corresponding member, and in 1884 an honorary member of the Philadelphia College of Pharmacy by whose authority the American Journal of Pharmacy is published. He is now the senior of the nine existing honorary members of the American Pharmaceutical Association, having been elected in 1871.

The task of writing a biographical sketch of one who is still living is not always easy, since the publication of too full details may offend the subject of the sketch, while the barest outline may not satisfy the reader. In the present case, there is no difficulty in steering a middle course. We have to record the greater part of a busy life chiefly spent in investigating, teaching and writing the truths of science as applied in the domain of pharmaceutical chemistry. The lapse of years is usually necessary before the proper niche in the temple of fame is assigned to any worker. The early biographer's task is therefore simplified. He needs simply to record facts, leaving future generations to draw deductions therefrom.

John Attfield was born on August 28, 1835, near Barnet, in the County of Hertford, where his ancestors had lived for many genera-

tions. The family name, originally "At-the-Field," is an uncommon one, so that little difficulty is found in tracing the family back to the fourteenth century. He owed his early love for scientific pursuits to his schoolmaster, the Rev. Alexander Stewart, then of Barnet, who lectured occasionally to his boys on chemistry and physics. Towards the close of the lad's school days the usual momentous question arose as to the choice of a vocation. He begged his father to enable him to follow up his studies in chemistry and physics. The family medical man was consulted on the matter, and he replied, "Article him to some member of the Pharmaceutical Society who makes most or many of his own preparations of drugs and some chemicals, and who practises analysis, so that if a livelihood should not present itself in chemistry and physics your son can fall back on pharmacy." This advice was followed, and the authorities at Bloomsbury Square helped in the finding of such a man (more common, alas! then than now). This was Mr. William Frederic Smith, a manufacturing chemist at Walworth, London, who further undertook, when he had taught his pupil what he knew of chemistry and physics and the art of pharmacy, to send him to classes at the Pharmaceutical Society's school, an arrangement which proved to be eminently satisfactory. Five busy years were spent working in gaining pharmaceutical experience, and during the last of these in attending as well classes at the School of Pharmacy. He passed the minor examination in 1854 with honors, and in the school took first prizes in all subjects, namely, the medals in chemistry and pharmacy, botany and materia medica. He was disqualified by age for entering for the major examination. An opportunity soon presented itself of devoting himself more closely to his favorite subjects. He obtained the position of junior assistant to Dr. Stenhouse, F.R.S., lecturer on chemistry in the medical school at St. Bartholomew's Hospital in September, 1854, and subsequently became demonstrator of chemistry at the same hospital. His connection with St. Bartholomew's lasted until 1862. During this period he devoted a considerable portion of his leisure time to literary occupations, which have always formed so important a part of his labors. He contributed some 200 articles to the English Cyclopædia, dealing chiefly with pharmaceutical chemistry. He also contributed the results of original research on various subjects. Of these the most important was a paper on "The Spectrum of Carbon," which was read at a meeting of the

Royal Society in 1862. This year would appear to have been at once the busiest and the most eventful of his life. In January of that year he was elected a Fellow of the Chemical Society, and later he made his first appearance as an analyst in a court of law in a case of poisoning by strychnine. In the summer of 1862 he was elected to the Chair of Practical Chemistry in the School of Pharmacy of the Pharmaceutical Society of Great Britain. Among the competitors for this post was Mr. (afterwards Sir) William Crookes, F.R.S. He then betook himself for a few months to Germany in order to obtain a degree. From the University of Tübingen he obtained the degrees of Master of Arts and Doctor of Philosophy. His paper on the carbon spectrum drew highly complimentary remarks from the examiners.

Professor Attfield had now entered upon what was to prove one of the chief occupations of his life. Possessed as he was of a retentive memory and a broad grasp of his subject, he filled with distinction the position to which he was elected. He set himself to develop and cultivate the intellectual powers of his pupils, rather than to cram them with facts. The records show that during the thirty-four years of his professorship no fewer than 2,367 students passed through his hands. Many of these subsequently distinguished themselves in their calling. Indeed, very large numbers of the British researches in pharmaceutical chemistry during his tenure of the professorship were conducted by his old students. The retentiveness of Professor Attfield's memory, to which we have referred, is well illustrated by the fact that he remembered the face, and in nearly every case, the name of each of his old students. The necessity of publishing a trustworthy text-book of practical chemistry was soon felt, and to this task he now devoted his attention. Taking as a basis some manuscript notes which he had prepared for the students at St. Bartholomew's he endeavored to combine the outlines of the principles of chemistry with the details of practical work. The result of his labors was the production in 1867 of the first edition of his "Manual of Chemistry." Its popularity is great on both sides of the Atlantic, the eighteenth English edition, edited by Dr. Leonard Dobbin, appearing in 1903. When a demand arose for the book in America, in May, 1870, the late Mr. William Procter, Jr., Mr. Ebert, of Chicago, and Mr. Markoe, of Boston, called on Mr. H. C. Lea and arranged with him the details as to the publication

of the manual in the United States. Since then seven editions have been adapted to the United States Pharmacopœia, and the eighth, that is, the nineteenth of the consecutive editions, is now in course of preparation. The total number of copies of the manual issued up to the present time is between 50,000 and 60,000.

One of the principal projects in which Professor Attfield has interested himself is the British Pharmaceutical Conference, of which he was one of the founders. The first annual meeting was held in 1863 at Newcastle-on-Tyne. The objects of the Conference were to promote pharmaceutical research and good fellowship among its members. These objects have been achieved with a success which the founders of that body probably never quite anticipated. The yearly meetings of the Conference have always been well attended, and over a thousand valuable scientific communications have been read before its members. In addition, this Association has published a "Year Book of Pharmacy," containing not only a full report of its meetings, but a digest of the scientific work bearing on pharmacy which has been published in other countries. The editorship of the Transactions was entrusted to Professor Attfield and retained by him for many years. For seventeen years after its inception, Professor Attfield was senior secretary of the Conference, and according to the testimony of Richard Reynolds and Henry B. Brady, the two other chief organizers, its large success owes much to his efforts. On relinquishing, in 1880, his official connection with the Conference as its honorary secretary, Professor Attfield was presented by the members of the Conference with 500 volumes of general literature, chosen by himself. The late Mr. Schacht, in making the presentation, referred in eulogistic terms to the past work of the retiring secretary. "Broadly speaking," said he, "it appears to me that the usefulness of our friend's life has consisted in this, that he first of all achieved a high and distinguished position for himself, and from that moment has endeavored to hold up both for our admiration and achievement that higher life of mental culture which is so plainly open to us in the very nature of our calling, but which we are so prone to forget amidst the pressure of business. It seems to me it has been in that constant protest against pharmacists sinking into anything like perfunctory drudges, and in his recommendation of the only genuine remedy for that, namely, that each man should do something, or at least try to do something, for the general good, that the main influ

ence for good of Professor Attfield's life has rested." He was afterwards President of the Conference in 1882–4.

Professor Attfield was now in the prime of life and was about to embark on those pharmacopœial labors which were to form so great a part of his life's work. But the scope of his activities throughout has been very wide. In 1864–5 he devoted considerable time to a revision of much of the chemistry of Brand's "Dictionary of Art, Science and Literature," and in 1866 he found time to revise and extend the chemical portion of the fourth edition of Clegg's work on the "Manufacture and Distribution of Coal Gas." The value of the metric system appealed forcibly to his practical mind. He keenly advocated its adoption in this country in place of our complex system of weights and measures, and at one time occupied a seat in the Council of the Metric Decimal Association. In addition he has published seventy original papers, the majority dealing with the results of his researches in chemistry and pharmacy, a list of which, to the year 1894, is given in Reber's "Gallerie hervorragender Therapeutiker und Pharmakognosten."

Professor Attfield was, in 1882, appointed by the General Medical Council to be one of the three editors of the 1885 edition of the British Pharmacopœia. After the appearance of that work he became successively annual reporter on the Pharmacopœia to the Medical Council, sole editor of the "Addendum" of 1890, of the "British Pharmacopœia" of 1898, and of the "Indian and Colonial Addendum" of 1900. The first digest of criticisms of the 1898 Pharmacopœia was edited by him in 1900, this being his last work in the capacity of "Reporter on the Progress of Pharmacy and Adviser on Pharmaceutical Chemistry." To him is due the union of pharmacists with the physicians in the compilation of the Pharmacopœia. He was the originator, in 1886, of the conversion of the hitherto nationally compiled Pharmacopœia into an imperially compiled Pharmacopœia. He himself largely organized the imperialization of the Pharmacopœia. The carrying out of this editorial work was a delight to one so gifted with organizing powers. It would occupy too much space to detail here the complex machinery which he set in motion. The story of the making of a Pharmacopœia would in itself form instructive and interesting material for a separate article. Suffice it to say that the Pharmacopœia was divided into seven sections, and of some of these as many

as seven separate proofs were sent out to the members of the Pharmacopœia committees of the General Medical Council and the Pharmaceutical Society. In each case at least four proofs were submitted; the first for general examination and for any additional adaptations of general principles, the second for revision, the third for provisional acceptance, and the fourth for confirmed acceptance. Each separate set of proofs was carefully examined by the editor when returned, and the suggestions and corrections were incorporated in his own copy for the printer. The writer was privileged at the time to render some little assistance to the editor in the library of his private house, the headquarters of the editorial work, and remembers particularly seeing a large, strong room in the basement, provided with shelves, on which were carefully arranged each set of proofs which had been employed in the production of the work, and annotated by the medical and pharmaceutical compilers, as well as all the correspondence connected with the undertaking. As illustrating the strong practical bent of the Professor, it is interesting to note that trays of freshly burnt lime were kept on the shelves for the purpose of keeping dry these valuable papers relating to the formation of the Pharmacopœia. As a result of this careful filing of documents, the editor could at a moment's notice trace any change in the Pharmacopœia back through all its transformations to the original suggestion. The nine annual reports (1886–94) on the Progress of Pharmacy in relation to the revision of the 1885 British Pharmacopœia, prepared by him for the General Medical Council, form a model of method and thoroughness. The editor took care that all original and trustworthy pharmaceutical work should be reflected in the pages of these reports. Considering the years of labor which he spent on the Pharmacopœia, it is not surprising that on one occasion at least it formed the subject of an address. The paper was entitled "The Pharmacopœia as a Student's Manual." The occasion was an introductory address delivered before the Students' Association of the School of Pharmacy of the Pharmaceutical Society of Great Britain in 1882. This address was reprinted at the time for distribution, and in a masterly manner showed the student how best to understand the Pharmacopœia, the complexity of its composition, and the necessity for the student to be familiar with the various sciences allied to pharmacy.

The Professor has always been felicitous as a maker of phrases.

Thus, he described pharmacy as "a mosaic of arts and sciences, of the chief details of which the Pharmacopœia is an index or catalogue." This address, which deserves reprinting into various languages for the benefit of students of pharmacy in all countries, concluded with a paragraph of caution and of encouragement. "If this short address should meet the eye of any pupil in pharmacy who thinks that the calling will not pay for such effort as is here shadowed forth, let him be confirmed in his idea. The effort will never repay *him*. Let him quit the calling. He has already lost enough time and money in following it; he will lose more if he remain. To the pupil whose heart is in his work, and who believes that such endeavors will bring a commensurate reward, to him due reward will come. Future success in pharmacy will lie with those best educated. In conclusion, I will only add that the most accomplished pharmacist owes most to the Pharmacopœia, and considers himself bound according to his opportunities to do his best to maintain its value. A true student of the Pharmacopœia, he never ceases to be its student. But his attitude towards it of thorough loyalty ever merges into one of good and intelligent scepticism: an attitude which provokes sound experimental research and results in improved processes and products."

Reverting to the Imperial Pharmacopœia, the Medical Council adopted his suggestion to extend the Pharmacopœia so that it might be of use to the Colonies and India. The work of imperializing the Pharmacopœia proved heavy, as some seventy dependencies had to be communicated with. It was felt that in many colonies there were indigenous drugs that might be used in the place of those official in the British Pharmacopœia, and so save the cost of importing. The wisdom of this step has quite recently been accentuated by the researches of Dunstan and Cash, who have shown that indaconitine and bikhaconitine, derived from Indian aconites, may be used instead of the aconitine from *A. napellus*. Professor's Attfield's work on the Pharmacopœia was officially appreciated. On May 31, 1898, the General Medical Council, on motion from the chair, passed a vote of thanks "to the editor, Dr. Attfield, for all that he has done to make the Pharmacopœia complete and accurate." *The Lancet*, commenting on this graceful act, said: "The whole profession will endorse the special vote of thanks awarded by the Council to Dr. Attfield."

On retiring from the Chair of Practical Chemistry at the School of Pharmacy, the Council of the Pharmaceutical Society accorded him the unusual honor of a vote of thanks. His former students marked the occasion of his retirement from the chair, which he had occupied 34 years, by presenting him with a testimonial. Mr. John Moss was the secretary of the Testimonial Committee, and over 1,000 old students and some 250 public scientific leaders responded to his invitation, suggesting the presentation of a mark of esteem. The testimonial took the form of a silver tray and a silver tea and coffee service, with a large and very beautiful album containing the actual signatures of the subscribers. The album contained an inscription from which a paragraph may appropriately be copied. "During the whole of this long tenure of his important office Professor Attfield not only won and retained the respect of successive generations of students by the lucidity, accuracy and thoroughness of his teaching, but he also endeared himself to them by his unfailing tact, kindness and urbanity. Not less successfully did he serve pharmacists and medical practitioners, and through them the public, by his versatile ability, untiring energy and power of organization as an editor of the Pharmacopœia and author of a manual of chemistry, and, generally, as a worker who unceasingly applied the resources of the great science of chemistry to the demands of the great art of healing." A portrait of the Professor had been produced by Hubert von Herkomer, C.V.O., R.A., his friend and neighbor, and since that day related to him by a marriage in the two families. At the presentation ceremony Mr. Moss spoke of the Professor in terms which give a more vivid pen-picture of the Professor than the writer could hope to do. Calling attention to an engraving of the portrait by Herkomer, a copy of which was presented to each of the subscribers to the testimonial, Mr. Moss said: "It is the face of a man of science, who, looking at a problem, regards it as a thing to be solved, and solve it he will. The features, firm and thoughtful, kindly and sympathetic, will recall to those to whom it goes hundreds of miles away from this place, the attractive face of one who has endeared himself to them by many acts of kindness and attention. It is the face of a man adept at smoothing away students' difficulties, whether in the study of theory, or in the practice of difficult manipulation. Seen close to, firmness and thought predominate.

At a short distance the expression seems to soften, and two or three yards away will be visible the genial humor that lurks in the eye and the corners of the mouth, ready to blossom into a smile under the warming influence of a friendly eye."

Fortunately for Professor Attfield, he has always consistently developed the social side of life. The Chemists' Ball, the Football and Cricket Club, the Students' Association, and the annual Old Boys' Dinner and Smoking Concert in connection with the School of Pharmacy are among the now cherished and flourishing institutions which he had so large a hand in founding and making successful.

We have now completed a review of the main incidents in Professor Attfield's public life. After his retirement from the Chair of Practical Chemistry and the cessation of his pharmacopœial labors he has enjoyed a well-earned retirement at his beautiful home at Watford, Herts. Though more than seventy years of age, he retains alertness and vivacity, and takes the same keen interest as ever in matters pertaining to pharmacy. There are few men to whom it is granted in a fuller measure than to Professor Attfield to see the fulfilment of their life-work. As pharmacist, author and professor he has succeeded in his aims; the proofs of this are seen in his published researches, his Manual of Chemistry, his editorial labors on two successive British Pharmacopœias, and his thirty-four years' successful occupation of the Chair of Practical Chemistry of the Pharmaceutical Society of Great Britain. In addition, his official standing in pharmacy gained for him a large and lucrative consulting practice. To all his undertakings he devoted an untiring energy and a capacity for work seldom equalled. The secret of his busy life may be said to consist in the methodical allotment of the hours of work and recreation, and the avoidance of haste and excitement. His success as a teacher will be readily understood by those who have read the preface entitled "Advice to Students" in the Manual of Chemistry, concluding with these words: "Students, in all honor and in the highest self-interest, take care that any inefficiencies inseparable from 'examination' are abundantly compensated by the extent and precision of your knowledge, and by the soundness and thoroughness of your whole education." Professor Attfield's views on education have always been of the broadest type. He has been a steady advocate of a curriculum of study, regarding the acquisition of knowledge merely for examination purposes as pernicious. Hence

he questioned any method of examining candidates which did not take note of the quality of the educational course which had been gone through. As a teacher he was pre-eminently kind and sympathetic; he made the instilling of knowledge secondary to the training of the innate powers of his pupils. One of these, Mr. J. A. Dewhurst, Ph.C., F.I.C., now Public Analyst of Halifax, Yorks, in a personal letter to the writer, thus speaks of his old Professor: "I am no hero-worshipper, but Professor Attfield has my real affection, born of a perhaps exceptionally intimate knowledge of him as teacher, employer and friend. As a teacher I found him unexpectedly considerate and courteous to an ordinary student. Whilst his assistant in connection with editorial work on the B P. and later in general analytical practice, I was impressed with his absolutely unvarying kindness. In his home, amidst his family, I was privileged to know him and found him still the same true gentleman. I count myself particularly happy in having known him, a living example which in my better moments I am content to emulate. Nor am I alone amongst his students in this—far from it." As a citizen Professor Attfield has taken an active part in the educational, sanitary, philanthropic, social and recreative movements in his native county. To a newspaper reporter he said not long ago: "I am an ardent patriot and politician, but cannot be a mere partisan. My vote, spare guineas and influence will always be at the disposal of the party that coquets least with incipient anarchy, neo-socialism and British disunion." It remains now only to refer to some of the honors which have been paid to Professor Attfield. In addition to the Fellowship of the Royal Society (1880), he is a Fellow of the Institute of Chemistry, and of the Chemical Society, and was for several years a member of the Councils of the two last-named bodies. He has enjoyed the rare and highly prized distinction of honorary membership of no less than twenty-three societies, associations and colleges of pharmacy in Europe, the British Colonies and America. He was President of the Hertfordshire Natural History Society in 1885–7. At present the only special monument in his honor is the Attfield Hall in the Chicago College of Pharmacy, where his portrait in oil is hung "in recognition of his aid in raising the College from its ashes in 1871 and of his unselfish devotion to the cause of education."

The writer is indebted for some of the facts here recorded to an

MAIN ENTRANCE TO THE ROYAL BOTANIC SOCIETY'S GARDENS IN REGENT'S PARK.

earlier biographical sketch, written by Professor Attfield's old friend and colleague, Mr. Joseph Ince, F.L.S., author of the well-known "Latin Grammar of Pharmacy." The portrait of Professor Attfield which illustrates this sketch was taken in the autumn of 1905, shortly after his seventieth birthday.

LONDON BOTANIC GARDENS.

By Pierre Élie Félix Perrédès, B.Sc., F.L.S.,
Pharmaceutical Chemist.
A Contribution from the Wellcome Research Laboratories, London.

(*Continued from p. 76.*)

III.

THE ROYAL BOTANIC SOCIETY'S GARDENS, REGENT'S PARK.

Regent's Park was opened in 1812, during the regency of the Prince of Wales, afterwards George IV, and named "Regent's Park" in his honor. The area now belted by a circular road known as the "Inner Circle," and consisting of over 18 acres of ground, was not included in the plan for laying out and planting the park, as it was the intention of the Prince Regent to erect a royal palace on that site. The project, however, was never put into execution, and, in 1838, we find that this plot of ground was occupied by a nursery garden, known as Jenkins' Nursery and Pleasure Ground. Towards the close of that year several influential people interested in botany approached Her late Majesty's commissioners with the object of obtaining a lease of Jenkins' Nursery from the Crown, for the purpose of converting it into a combined ornamental and botanic garden. Their quest was successful, and, in 1839, the Royal Botanic Society of London was permanently established, a Royal charter being granted to Bernard Edward, Duke of Norfolk; Charles, Duke of Richmond; William Charles, Earl of Albemarle; Lieutenant-Colonel Robert Rusbrooke; Philip Barnes (the originator of the scheme); and James de Carle Sowerby, "for the promotion of botany in all its branches, and its application to medicine, arts, and manufactures, and also for the formation of extensive botanical and ornamental gardens within the immediate vicinity of the metropolis."

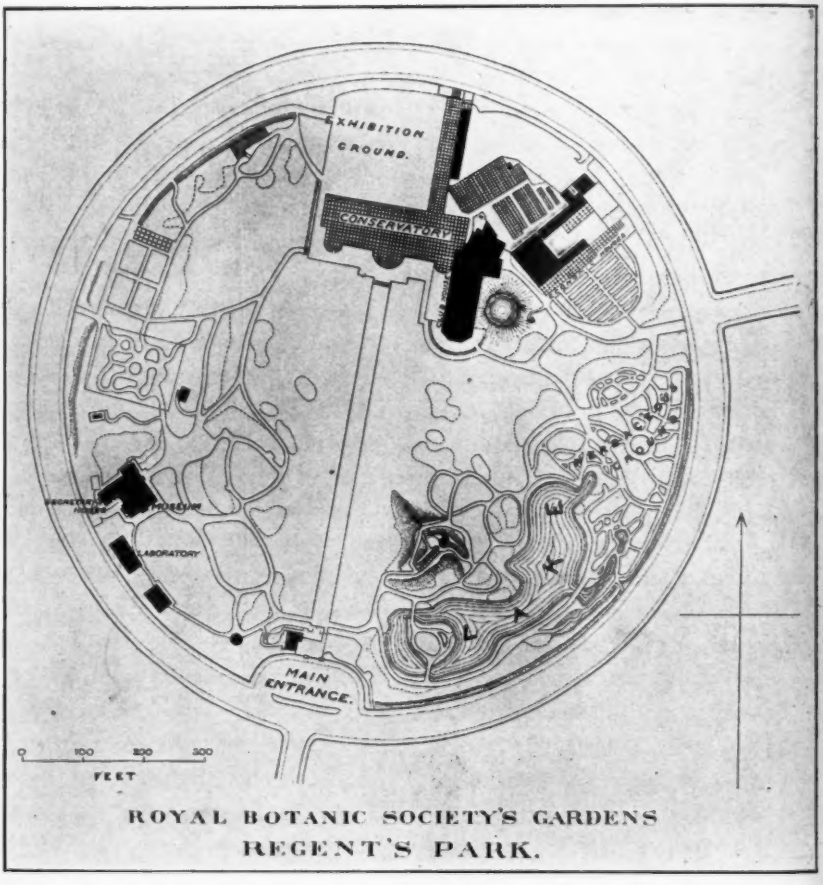
The property, when taken over by the Society, consisted of "a nearly level plateau, only rising gently from the circumference to

Main Entrance to the Royal Botanic Society's Gardens in Regent's Park.

the centre." The contents, bought from the nurseryman for £2,000, consisted of the following: A belt of elm trees of considerable size on the outer margin; an inner circle of small beeches; a group of trees on a lawn, where the secretary's house and museum now stand, and a few other trees scattered about; two old greenhouses; a cottage of wood and brick; some sheds; and general nursery stock.

One of the first steps taken by the Fellows of the Society was directed towards the accomplishment of the main purpose of their charter, namely, the conversion of the plot of ground they had acquired into a botanical and ornamental garden. With this object in view a prize was offered by the Society for the best plan submitted dealing with the laying out of the ground along these lines. The difficulties that the numerous competitors had to contend with, in constructing a plan for a garden that would combine the requisite scientific features with those of an ornamental ground, were so great, that, although the prize was awarded for one of the plans sent in, the latter was not considered sufficiently satisfactory for adoption in its entirety. It is to R. Marnock, who was appointed Curator on the recommendation of J. C. Loudon, the well-known horticulturist, that the Society is indebted for the very effective arrangement of its gardens, and it is indeed difficult to realize that their diversified landscape has been artificially evolved from a nearly flat piece of market garden.

The soil which Marnock had to deal with was the rather uninviting London clay, a stiff clay sprinkled with coarse gravel, the latter becoming more abundant a little to the south of Regent's Park; this clay, however, by reason of its impermeability, was well adapted to the first operation that was undertaken, namely, the formation of the Lake (see Plates XVII and XVIII). The material removed for this purpose was utilized in constructing the mound which divides the Lake from the main walk (see Plate XVII for this and other details described below). The north of the gardens was next attacked and the terrace constructed. On the southern portion of this terrace the principal portion of the Conservatory was erected in 1845, the wings being added later, the east wing in 1870, the west wing in 1875, by private subscription among the Fellows. This conservatory was the first iron and glass house of considerable size erected in England, while its heating arrangements were also a novel feature at the time. The hot-water pipes are placed under-



PLAN OF THE ROYAL BOTANIC SOCIETY'S GARDENS.

NOTE.—*The plant houses are indicated by crossed lines, and the other buildings by black areas.*

THE LAKE IN THE ROYAL BOTANIC SOCIETY'S GARDENS.

ground instead of being above the surface, as is usually the case; this arrangement presents a neat appearance, but it is rather wasteful. The east wing of the Conservatory is partitioned off as a tropical house, the main body of the building being heated to an intermediate temperature (between 50° and 60° F. in winter). The northern portion of the terrace, situated at the back of the Conservatory, was converted into an exhibition ground, new features being introduced into the arrangement of this also, in that sloping grass banks were substituted for the conventional tables under tents, and the whole was covered over with one spread of canvas. This system, however, has now been abandoned, and the customary method reverted to.

An arboretum was included in the original laying out of the gardens, but, owing to the limited space available, it has been reduced; there are, nevertheless, many handsome and interesting trees, including some fine willows. On the west, a Spring Garden, an American Garden, a Rose Garden, an Italian Garden, and an agricultural department were formed. These have been suppressed with the exception of the American Garden, which has preserved its initial arrangement, albeit it is now devoted to a show of rhododendrons, exhibited during the spring and summer months. Immediately to the north of this a horticultural ground has been laid out for the use of the students of the recently established horticultural school of the Society.

The portion of the gardens which possesses most interest for us is situated on the northeast, where the Economic Department is located, and on the east, near the upper end of the lake, where the Herbaceous Ground is to be found. The economic section proper, which has always received special attention at the hands of the Society, consists of a collection of trees and shrubs, and of a range of three lean-to houses maintained at three different temperatures, the central one, or stove, being heated to 65°—70° F., and the end ones to 60°—65° F. and 45°—50° F. respectively. The economic garden formerly comprised a central portion for the reception of hardy herbaceous plants, and an outer portion surrounding it, in which economic trees and shrubs were grown, but the contents of the former have now been merged into the general herbaceous collection. In the Herbaceous Ground, which is especially rich in medicinal plants, the original arrangement of the plants has been

adhered to, and is of special interest because it also originated with Marnock. Obvious as its advantages are, it only appears to have been adopted in one other garden in the kingdom, this being at the Cambridge Botanic Garden, where the energetic curator, Mr. R. Irwin Lynch, has made use of it to the greatest advantage. The beds are of different shapes and sizes, and are so laid out that each bed accommodates the plants belonging to one natural order. By this means the relative magnitudes of the various orders are shown at a glance. Closely related natural orders, furthermore, are grouped together, so that their relationships, as well as their respective importance in numbers, are indicated. In the centre of the Herbaceous Ground there is an enclosure containing a set of meteorological instruments, including a series of earth thermometers from a depth of 3 inches to one of 16 feet below the surface of the ground. Records of these readings are made three times a day, and the most important of these are printed in the society's "Quarterly Record."

The following is a list of the more interesting medicinal plants grown out of doors; some of them are to be found in the section especially devoted to economic plants, but the largest number is in the Herbaceous Ground:

Abies balsamea, Mill.; *Achillea Millefolium*, L.; *Aconitum Napellus*, L.; *Acorus Calamus*, L., or Sweet Flag; *Alkanna tinctoria*, Tausch., from which Alkanet root is obtained; *Althæa officinalis*, L., the Marshmallow; *Anthemis nobilis*, L.; *Artemisia Absinthium*, L.; *Arundo Donax*, L., the "*Canne de Provence*" of the French Codex; *Atropa Belladonna*, L.; *Carthamus tinctorius*, L.; *Chrysanthemum Parthenium*, Bernh.; *Colchicum autumnale*, L.; *Crocus sativus*, L.; *Cytisus Scoparius*, Link.; *Daphne Laureola*, L., and *D. Mezereum*, L., two of the three species of *Daphne* yielding the Mezereon Bark of the British Pharmacopœia; *Datura Stramonium*, L.; *Delphinium Staphisagria*, L.; *Digitalis purpurea*, L.; *Ecballium Elaterium*, A. Rich, the Squirting Cucumber, from which Elaterin is prepared; *Eupatorium perfoliatum*, L.; *Ferula Narthex*, Boiss., and other species of *Ferula* yielding gum-resins; *Ferula Sumbul*, Hook. f.; *Fœniculum capillaceum*, Gilib.; *Fraxinus Ornus*, L., the Manna Ash; *Gentiana lutea*, L., from which the official Gentian Root is obtained; *Glycyrrhiza glabra*, L., or Liquorice; *Inula Helenium*, L.; *Iris Florentina*, L., and other species yielding fragrant rhizomes; *Juniperus Sabina*, L.; *Laurus nobilis*, L.; *Linum usitatissimum*, L.; *Mandragora officinarum*, L.; *Melissa officinalis*, L., or Balm; *Melilotus officinalis*, Lam., or Melilot; *Mentha piperita*, L., the Peppermint, and *M. Pulegium*, L., or Pennyroyal; *Menyanthes trifoliata*, L., or Bog bean; *Nicotiana Tabacum*, L.; *Papaver somniferum*, L.; *Peucedanum graveolens*, Benth.; *Phytolacca decandra*, L., the source of Poke root; *Polygonum Bistorta*, L., or Bistort; *Polypodium vulgare*, L., whose rhizome is official in the French Codex; *Pulmonaria offici-*

GENTIANA LUTEA, L.,
Growing in the Royal Botanic Society's Gardens.

VERATRUM VIRIDE, SOLAND.,
Growing in the Royal Botanic Society's Gardens.

nalis, L., or Lungwort, whose leaves, still retained in the Codex, are a relic of the old doctrine of signatures; *Quercus pedunculata*, Ehrh., and *Q. Suber*, L.; *Rhamnus catharticus*, L.; *Rheum officinale*, Baill., and *R. palmatum*, L., var. *tanguticum*, sources of Chinese Rhubarb; *Rosmarinus officinalis*, L., or Rosemary; *Ruta graveolens*, L., or Rue; *Rubia tinctorum*, L., Madder; *Sambucus nigra*, L.; *Sanguinaria Canadensis*, L; *Solanum Dulcamara*, L.; *Tanacetum vulgare*, L.; *Taraxacum officinale*, Weber; *Trigonella Fœnum-græcum*, L., or Fenugreek; *Tussilago Farfara*, L.; *Valeriana officinalis*, L.; *Veratrum viride*, Soland.; and *Verbascum Thapsus*, L., or Mullein.

The range of Economic Houses was first erected in 1873, under the secretaryship of Mr. W. Sowerby. It was entirely rebuilt last year (1904), and although several plants were lost owing to the severe weather that occurred while the work was being proceeded with these are being rapidly replaced. The following is a list of some of the more interesting plants, from the pharmacist's point of view, growing in these houses at the present time; they are being added to every day, and the collection, which is already the most complete one of living exotic economic plants in London, will be, before long, a thoroughly representative one:—

Aloe vera, L., and other species of Aloe; *Areca Catechu*, L.; *Balsamodendron Myrrha*, Nees; *Bixa Orellana*, L.; *Cæsalpinia Sappan*, L., whose heart-wood is official in the Colonial and Indian Addendum of the British Pharmacopœia, under the name of "Sappan;" *Canella alba*, Murr.; *Castilloa elastica*, Cerv., source of Central American rubber; *Chondodendron tomentosum*, R. & P., the source of true Pareira Brava; *Cinchona officinalis*, L., and other Cinchonas yielding medicinal barks; *Cinnamonum Camphora*, Nees; *Convolvulus Scammonia*, L., source of Scammony root, Scammony, and Scammony resin; *Croton Eluteria*, Benn., from which Cascarilla bark is obtained, and *C. Tiglium*, L.; *Curcuma longa*, L.; *Dipteryx odorata*, Willd., the plant which yields Tonka beans; *Drymis Winteri*, Forst., the source of true Winter's bark; *Eucalyptus globulus*, Labill., and other species of *Eucalyptus*; *Euphorbia resinifera*, Berg; *Ficus elastica*, Roxb., from which East Indian rubber is obtained; *Gossypium herbaceum*, L., and other species of *Gossypium*; *Gynocardia odorata*, R. Br., formerly supposed to be the source of Chaulmoogra seeds and oil; *Hevea Braziliensis*, Muell., from which Para rubber is obtained; *Illicium verum*, Hook. f.; *Landolphia gummifera*, Lam., the source of Madagascar rubber; *Musa sapientum*, L., and var. *Paradisiaca*; *Nicotiana Tabacum*, L.; *Nopalea coccinellifera*, Salm-Dyck; *Opoponax Chironium*, Koch.; *Peumus Boldus*, Molina; *Piper angustifolium*, L., *P. Betle*, L., *P. Cubeba*, L., and *P. longum*, L.; *Pogostemon Patchouli*, Pellet., the essential oil of which is used in perfumery; *Ricinus communis*, L., *Santalum album*, L.; *Smilax officinalis*, Kunth, the reputed source of Caracas Sarsaparilla; *Strychnos Nux-vomica*, L.; *Styrax Benzoin*, Dry.; *Terminalia sp.*, yielding Myrabolans; and *Urginea maritima*, Baker.

The conservatory is chiefly used for the display of ornamental plants, but it also includes a few that are of medicinal interest, such as various species of *Aloe; Cereus grandiflorus*, Mill.; *Illicium verum*, Hook. f.; *Peumus Boldus*, Molina; several of the rubber-yielding plants; various *Eucalypti; Nopalea coccinellifera*, Salm-Dyck; *Musa sapientum*, L., and varieties, etc. In connection with the last-named genus, it is of interest to note that it was from a plant grown in this conservatory that the late Queen Victoria tasted the banana for the first time. At the rear of the conservatory, to the east, there is a glass corridor flanking the exhibition ground on the east, and leading out to the gate at the north end of the gardens; this is used for educational and other exhibitions from time to time. It is ornamented with creepers up the sides and roof, and with a row of camellias on each side, which can be removed while exhibitions are being held—otherwise it is unoccupied.

In addition to the economic houses and conservatory, and situated between them, there are houses for the accommodation of filmy ferns, succulents, ferns, orchids, etc., and a large Victoria Regia House, opening into the corridor of the conservatory. These, with the exception of the succulent house, contain no plants of medicinal interest, and there is nothing in the last-named which is not equally well represented in the Economic Houses. Other adjuncts of this section of the gardens are propagating houses and frames, a plant hospital, potting sheds, etc.

The secretary's house, and the adjoining museum, which is also used as a council-room and as a fellows' meeting-room, was erected in 1851 to take the place of the cottage of wood and brick mentioned above. The specimens in the museum were at first entirely educational in character; these have been retained and added to, and comprise an interesting series, illustrating the natural history of plants. In the course of time, however, this special collection has developed into a general botanic and economic one; it comprises a goodly collection of drugs, including a series of the different varieties of aloes, tea and india-rubber, and a sample from the first consignment of gutta-percha brought into this country; the collection of gums and gum-resins is an extensive one, as is also that of vegetable oils and fats. Of secondary interest to us are the collections of tropical fruits and vegetables, of woods and dyes, and those of tanning materials, fibres and fibre-plants and cereals. In addition

PLATE XXI.

SECRETARY'S HOUSE AND MUSEUM, ROYAL BOTANIC SOCIETY'S GARDENS.

to the specimens themselves, there is, in the museum, a valuable collection of oil paintings of plants and flowers by the Hon. Evelyn Ellis.

The Laboratory was built in 1902, in connection with the Gardening School. It is fitted up with benches, gas and water being laid on, and is also adapted for use as a lecture hall.

THE WORKING OF THE GARDENS.

The management of the Society's affairs, including the Gardens, is in the hands of a Council elected by vote of the Fellows. A president is also elected yearly, but, up to the present, every president has been re-elected until his death. The first president was Charles, Duke of Richmond (to 1842); the second, Bernard Edward, Duke of Norfolk (to 1856); the third, the late Prince Consort (to 1862); the fourth, Lord de La Warr (to 1869); the fifth, the Duke of Teck (to 1898); and the sixth, his son, the present Duke of Teck, who still occupies the position. The Society has, moreover, always enjoyed distinguished patronage; the late Queen Victoria was its patron from the beginning, until her death, and the Duchess of Kent and the Duke and Duchess of Cambridge the first vice-patrons. King Edward is the present patron and Queen Alexandra, patroness, while the Prince and Princess of Wales are vice-patron and vice-patroness respectively.

The principal officer of the Society is the Secretary. J. de Carle Sowerby, one of the founders, was the first to hold office in this capacity, and this post has since been occupied by members of the same family, the present Secretary being Mr. J. Bryant Sowerby, F.L.S.

The gardening staff is in charge of Mr. E. F. Hawes, who is likewise Chief Instructor of the Practical Gardening School. There is also a Curator attached to the Museum.

The Society, depending entirely as it does upon the Fellows' subscriptions for its funds, has found it necessary to effect a compromise in the organization of its functions, especially in view of the fact that the renewal of the lease of the Gardens from the Crown, in 1901, was only secured by paying a higher price than before. The inducement required to attract a larger number of Fellows has been provided by the introduction of a number of features for their comfort and amusement, such as a croquet and tennis ground, suitable

accommodations for garden fêtes, frequent displays of flowers and decorative plants, and a club house.

It is, however, in its educational capacity that the Society claims our attention, for in so far as medical and pharmaceutical students are concerned, it undoubtedly fulfils the chief rôle in London in supplying the necessary materials for the study of living plants. Close upon seven hundred students' tickets are issued annually through the medium of the professors and teachers in the respective schools, these tickets being available daily, until 3 o'clock in the afternoon; after that hour the Gardens are reserved for the use of the Fellows and visitors. In addition to this, from 50,000 to 60,000 cut specimens are distributed among such students every year. Lectures in Botany were formerly delivered on certain mornings in the Gardens to the students of the Pharmaceutical Society's School, but they have been discontinued for some years.

Among the educational features of the Society the lectures delivered from time to time on botanical subjects must be included; these, together with the other proceedings of the Society, are published in its "Quarterly Record."

In 1897 the educational side was further developed by the institution of a Practical Gardening School. The training consists of a course, extending over a period of three years, which is essentially practical in character, although it is accompanied by a series of lectures delivered in the Laboratory. The students consist, in part, of pupils who have obtained scholarships from the London School Board—now the Education Department of the London County Council. These, originally ten in number, acquitted themselves so satisfactorily that the number has since been increased to twenty. In addition to the scholars, there are several independent students, many of whom are ladies.

This account would not be complete without a concluding reference to the educational exhibitions that are occasionally held in the Gardens. These are illustrative of work done in schools on the too-long neglected subject of Nature Study, and must appeal to everyone who has the cause of education at heart.

[Further details concerning the Royal Botanic Society's Gardens will be found in the Society's "Quarterly Record," first published in 1880, and continued from that date to the present time. In vol. III of that publication (No. 36, p. 216. London, 1888) there is a short historical account of the Society contributed by

Mr. W. Sowerby, the Society's secretary at that time, on the occasion of the fiftieth anniversary of the Society. There is also an official Guide to the Gardens (London, 1900) which contains a number of interesting photographs of their characteristic features, in addition to an excellent popular account of the Gardens by Mrs. J. B. Sowerby. More recent developments still are briefly summarized in an illustrated booklet issued by the Council, and entitled "The Royal Botanic Society of London."]

(*To be continued.*)

ESTIMATION OF CASEINE.—A PRELIMINARY STUDY.[1]

By H. V. Arny, Ph.D., and T. M. Pratt, Ph.C.

The marked need for a simple and reliable estimation of caseine is apparent to all chemists doing milk analysis. The only direct volumetric process—that of Denigè (*Jour. Pharm. et Chem.*, Series 6, VII, No. 1) is too complicated for practical purposes; while the generally accepted method of nitrogen estimation by the Kjehldahl process, involving as it does digestion with sulphuric acid and mercury, distillation of this mixture with potassium sulphide and alkali and final titration of the distillate for ammonia with volumetric solution of sulphuric acid, and that only after separation of the lactalbumin and globulin, is even more intricate and time-consuming.

Needing a quick process, one of us tried the simple expedient of noting the amount of potassa alum required for the complete precipitation of caseine from milk, and the results on rough estimations were so satisfactory and pointed so convincingly to the fact that alum combined with caseine in molecular proportions, that attempt was made to bring the process within a limit of reasonable accuracy.

The scheme consisted of slowly dropping alum solution from a burette into warm diluted milk, until precipitation was complete. Experience shows that uniform heat was essential for definite results, since cold milk requires more alum for precipitation than does warm and that in proportion to heat employed.

The weakness of this process lay in the difficulty in deciding the point of complete precipitation. Yet, it is a striking fact that of 1,000 samples examined during two years, 694 required 2·9 to 3·1 c.c. concentrated alum solution for precipitation of 25 c.c. of milk, while

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[1] Presented at the Atlantic City meeting of the American Pharmaceutical Association, September, 1905, and contributed by the authors.

the amount of solution for the entire 1,000 samples ranged only from 2·6 to 3·2 c.c. to 25 c.c. milk.

The writers have since found that Schlossman (*Ztschr. physiolog. Ch.*, vol. 22, p. 197) employed a concentrated alum solution for the separation of caseine from the other milk albuminoids; estimating the amount of caseines, however, by submitting the precipitation to the Kjehldahl process. It is interesting to note that he mentions that 1 to 1·5 c.c. concentrated alum solution is necessary for the complete precipitation of caseine from 10 c.c. milk, thus confirming the writers' figures on 25 c.c. milk, given above.

Finding the estimation satisfactory in principle, efforts were made toward greater accuracy. In using alum solution alone, the end of precipitation is obscured by a slight greasiness of the liquid and attempts were made to obviate this by addition of alkali, such as sodium carbonate, bicarbonate or borate. While these did aid in giving a clearer precipitation their use complicates final calculations and was abandoned.

The next efforts were toward proving the end of reaction by indications of alum in the whey, but work in this direction was hampered by lack of a delicate color reagent for alum. Decoction of logwood, suggested by Mrs. Richards ("Leffmann's Water Analysis," 1895, p. 59), gives a brilliant color test, but experiments proved that it was not sufficiently delicate for the dilution of alum found in the whey.

Failing to find a sensitive color test of potassa alum, attention was turned to ferric alum, experiments showing that both ferric and chrome alum precipitated caseine from milk with the same facility as does potassa alum.

The first plan was to add a decinormal ferric alum solution to diluted milk, filtering a few drops of the whey upon a crucible top and bringing in contact with the filtrate a drop of solution of potassium ferrocyanide or potassium sulphocyanate. The result of these experiments was far from satisfactory, it being found that the end of reaction was scarcely more sensitive in the high degree of dilution required than it was with alum and logwood decoction.

An interesting fact noted was that the filtrate did not respond to the iron test with the reagents until long after all the caseine had been precipitated; while on the other hand, when the ferrocyanide solution was first treated with acetic acid, the response was much

earlier. This phenomenon is evidently due to the fact that the albumin of the milk forms a soluble iron albuminate, which does not respond to ferrocyanide until decomposed by acid. This may eventually lead to a quick method of estimating total proteids of milk, but so far, results obtained have been too variable for practical use.

Failing along all these lines for results trial was made of precipitating milk with a definite excess of decinormal ferric alum solution, filtering off the precipitated caseine and estimating amount of ferric alum remaining in the filtrate by titration with potassium iodide, hydrochloric acid and decinormal sodium thiosulphate. The process at present employed is as follows: 20 c.c. decinormal ferric alum solution (48·1 grammes to the liter) is mixed with the desired amount of milk—5, 10, 20 or 30 c.c.—at ordinary temperature, some water added, the mixture shaken and allowed to stand a few minutes and then filtered, the precipitation being washed until the washings are free from iron. Either the whole filtrate or half of it is titrated with potassium iodide, acid and thiosulphate, and thus the amount of unused ferric alum is ascertained. The difference in the amount of ferric alum in the original solution and the amount used gives the quantity of ferric alum required for precipitation of caseine.

Figures on this work are here given:

TABLE I.

All samples treated with 20 c.c. decinormal ferric alum solution.

Milk sample.	Cubic centimetres milk used.	Cubic centimetres decinormal thiosulphate required.	Cubic centimetres decinormal ferric alum used for milk.
1 a	10	16·2	3·8
1 b	10	16·2	3·8
1 c	5	18·2	1·8
1 d	5	18·4	1·6
2 a	10	16·4	3·6
2 b	10	16·4	3·6
2 c	5	18·0	2·0
2 d	5	18·0	2·0
2 e	5	18·0	2·0
3 a	5	17·9	2·1
3 b	5	18·0	2·0
3 c	10	16·2	3·8
3 d	10	16·0	4·0
3 e	15	14·4	5·6
3 f	15	14·4	5·6
4 a	25	9·8	10·2

4 b	25	9·8	10·2
5 a	20	12·0	8·0
5 b	20	12·2	7·8
5 c	10	16·0	4·0
5 d	10	16·0	4·0
6 a	20	12·0	8·0
6 b	20	11·8	8·2
6 c	10	16·0	4·0
6 d	10	16·0	4·0
7 a	30	8·0	12·0
7 b	30	8·0	12·0
7 c	20	12·0	8·0
7 d	20	12·0	8·0
7 e	10	16·0	4·0
7 f	10	16·2	3·8
8 a	5	18·0	2·0
8 b	5	18·0	2·0
8 c	10	16·0	4·0
8 d	10	16·0	4·0
8 e	20	12·0	8·0
8 f	20	12·0	8·0
9 a	20	11·8	8·2
9 b	20	11·8	8·2
9 c	10	15·8	4·2
9 d	10	15·9	4·1
10 a	5	18·0	2·0
10 b	5	18·0	2·0
10 c	10	16·2	3·8
10 d	10	16·0	4·0
10 e	20	11·8	8·2
10 f	20	12·0	8·0

As shown by above figures the results are definite as to caseine content. It will be observed that the amount of ferric alum used for 5, 10, 20 or 30 c.c. is in direct proportion to these amounts, and that the variation on different samples of milk is no greater than would be expected of its varying caseine content.

The feasibility of the process depends on whether the other constituents of the milk, such as sugar and fat, enter into the reaction with ferric alum. The following experiments seem to show that such fears are groundless.

Filtrate from 10 c.c. milk, plus 20 c.c. ferric alum solution, required 16·2 c.c. decinormal thiosulphate solution. Filtrate from 10 c.c. same milk, plus 0·4 grammes milk-sugar (same amount as in original milk), required 16·2 c.c. decinormal thiosulphate solution.

Thus, in one sample of milk, there was twice as much sugar as in the other, and yet the amount of thiosulphate required was practically the same in both cases.

In connection with this, Long (*Jour. Am. Chem. Soc.*, Vol. XIX, p. 683) has published elaborate work, showing that sugar eventually reduces ferric salts to the ferrous state.

However, he notes that the change is first noted after standing forty-eight hours, and in the present process, the entire time from adding ferric alum to milk to the final titration, need not exceed six hours; hence the results given above in no way run counter to Dr. Long's statement.

As to influence of fat:

20 c.c. milk, plus 20 c.c. ferric alum solution required 12 c.c. thio. solution.
20 c.c. " " 20 c.c. " " " " 11.6 c.c. " "
20 c.c. " " 0·6 gm. butter, plus 20 c.c. ferric alum solution, required 11·6 c.c. thiosulphate solution.
20 c.c. milk, plus 0·6 gm. butter, plus 20 c.c. ferric alum solution, required 11·66 c.c. thiosulphate solution.

Thus, double the theoretical amount of fat does not affect the results. As already mentioned, the question of the temperature of the milk is of the greatest importance, and the figures of a large amount of preliminary work with ferric alum were rendered useless for this paper, because the mixture of milk and ferric alum were warmed before filtration. Later experiment showed that, unlike the precipitation of caseine with potassa alum, heat was not necessary to facilitate the filtration of whey and led to the variation in the figures obtained.

Heat affects the coagulation of ferric albuminate, while in cases of cold admixture it remains in solution or at most in soluble colloidal form. Thus, if the filtrate from a ferric alum precipitate is divided into two portions, and one-half is titrated just as it is while the other half is boiled and filtered, and the second filtrate titrated; the latter requires much less thiosulphate solution than the first half.

Time has prevented careful investigation of this important point within which possibly lies the germ of a volumetric estimation of total proteids in milk, even as does the cold process give us the amount of caseine.

It will be noticed that with practically all samples of milk reported in Table I, 10 c.c. milk required 4 c.c. decinormal ferric alum solu-

tion (0·1924 gramme ferric alum) for precipitation of caseine. This factor is, however, insufficient as a standard of milk-testing, and therefore a line of comparative tests between amount of ferric alum consumed and amount of nitrogen in the caseine by the Kjehldahl process was instituted.

In this line of experiments, 20 c.c. decinormal ferric alum solution was placed in a Kjehldahl distilling flask and 10 c.c. milk and about 20 c.c. water added. The precipitate was transferred to a filter, washed free from soluble iron and the filtrate titrated with decinormal thiosulphate solution. The precipitate and filter was dried, placed in the original dried Kjehldahl flask to the walls of which some of the precipitate still remained clinging. The contents of the flask were then digested with sulphuric acid and mercury, distilled with potassium sulphide and alkali and the liberated ammonia was titrated with decinormal sulphuric acid. Blank experiments, including filter-paper, were carried on at the same time and correction made in the caseine estimation. The results are shown in the table appended:

TABLE II.

In all 10 c.c. milk was mixed with 20 c.c. decinormal ferric alum solution, the filtrate titrated with decinormal sodium thiosulphate solution, while the precipitate was assayed for nitrogen by the Kjehldahl process. In the columns marked "Percentage Caseine" "a" gives the figures obtained by multiplying weight of nitrogen by 6·25 x 10, while "b" gives results in using factor 6·38 x 10.

	Filtrate.		Precipitate.			
Milk sample.	Cubic centimeters decinormal thiosulphate requ'd.	Cubic centimeters decinormal ferric alum used by milk.	Cubic centimeters decinormal sulphuric acid needed.	Am't of nitrogen in grammes.	Percentage caseine. a	b
1 a	15·8	4·2	25·5	0·0357	2·23	2·28
1 b	16·0	4·0	25·0	0·0350	2·19	2·23
1 c	16·0	4·0	26·0	0·0364	2 27	2·33
2 a	16·1	3·9	24·0	0·0336	2·10	2·14
2 b	16·	4·0	23·0	0·0322	2·01	2·05
2 c	16·	4·0	24·0	0·0336	2·10	2·14
2 d	15·9	4·1	23·5	0·0329	2·05	2·10
3 a	16·4	3·6	26·0	0·0364	2·27	2·33
3 b	16·0	4·0	26·6	0·0372	2·32	2·37
3 c	16·0	4·0	26·5	0·0371	2·32	2·36
3 d	16·2	3·8	26·0	0·0364	2·27	2·33
4 a	15·9	4·1	24·5	0·0343	2·14	2·19

4 b	16·0	4·0	25·0	0·0350	2·19	2·23
4 c	15·9	4·1	25·5	0·0357	2·23	2·27
4 d	15·8	4·2	26·0	0·0364	2·27	2·33
5 a	16·0	4·0	25·3	0·0354	2·20	2·25
5 b	15·8	4·2	25·0	0·0350	2·19	2·23
5 c	15·8	4·2	25·9	0·0362	2·26	2·31
5 d	15·6	4·4	25·5	0·0357	2·23	2·28
6 a	15·7	4·3	24·5	0·0343	2·14	2·19
6 b	15·9	4·1	25·0	0·0350	2·19	2·23
6 c	16·2	3·8	24·3	0·0340	2·12	2·17
6 d	15·8	4·2	25·5	0·0357	2·23	2·27

To establish the definite standard, it will of course be necessary to make a large number of comparative estimations, and that with officially standardized measures instead of ordinary laboratory glassware. Such work will be performed by the writers during the coming winter, and it is hoped that other investigators will take up the same line of experiments; for if the ferric alum estimation is entirely feasible, it will prove vastly superior to the cumbersome and tedious Kjehldahl process now in vogue.

In conclusion, a few remarks as to methods of manipulation may be in place. The most convenient amount of reacting ingredients is 10 c.c. milk and 20 c.c. decinormal ferric alum solution (48·1 gramme to the liter). This amount of ferric alum solution requires exactly 20 c.c. decinormal thiosulphate solution to decolorize the iodine liberated by it and the acid from the potassium iodide, and each cubic centimeter of thiosulphate solution less than twenty, required after combination with milk, means a cubic centimeter of ferric alum solution employed in precipitation.

The milk and ferric alum solution are mixed cold and it seems to make but little difference whether the milk be added to the ferric alum solution or vice versa. The mixture is allowed to stand fifteen or thirty minutes and then filtered, and for this purpose a pledget of cotton in a glass funnel is found most satisfactory. If filter paper is used the iron creeps to the edge of the paper, from which it is washed with much difficulty. Pressure filtration was tried—to quicken process—but with results scarcely as satisfactory as filtration through cotton. At its best, the process of filtration is tedious, yet we have washed out precipitates in two hours and a batch started in the afternoon can always be ready for titration the next morning.

In filtering, best results are obtained by throwing precipitate on filter in fairly concentrated liquid: that is, the total fluid need not

measure more than 50 c.c. The distilled water used for washing the precipitate should be added before all of the preceding liquid has run through; for the drained precipitate becomes a firm mass through which liquid passes with difficulty. The filtrate is usually free from iron when it measures 200 c.c. (at times it is iron free when 150 c.c. have passed through), and either the total filtrate or an aliquot part can be titrated with thiosulphate solution. The titration is carried on as provided in the assay of ferric alum given in U.S.P., 1900.

In passing it might be noted that the strength of ferric alum and thiosulphate solutions used in this work are based on the molecular weights of the U.S.P., 1890, since experiments were started before the appearance of our present standard.

In filtration, care must be taken that the liquid as it drops from the funnel is clear and if it is cloudy it must be returned until it does drop clear. Shortly after the filtration the liquid becomes slightly turbid, due undoubtedly to separated ferric albuminate. It was feared that the precipitate might be caseine instead of ferric albuminate and thus prove a source of error. That there was little danger of this, provided the filtrate was originally clear, seemed shown by the uniformity of figures in Tables I and II, but to settle the question, six samples of the same milk,—a, b, c, d, e, and f—were assayed. One set—a, c, and e—the originally cloudy liquid was refiltered before titration; while their duplicates, b, d, and f, were titrated in cloudy condition, with the following results:

TABLE III.

All with 20 cubic centimeters decinormal ferric alum solution.

Milk sample.	Amount milk used.	Cubic centimeters decinormal thiosulphate required.	Cubic centimeters decinormal ferric alum used by milk.
a	5 c.c.	18	2·0
b	5 c.c.	18	2·0
c	10 c.c.	16	4·0
d	10 c.c.	16	4·0
e	20 c.c.	12	8·0
f	20 c.c.	12	8·0

As the results of titration in both cases were identical, the amount of separated substance must be insignificant.

PHARMACEUTICAL LABORATORY,
CLEVELAND SCHOOL OF PHARMACY.
August, 1905.

PROGRESS IN PHARMACY.

A REVIEW OF SOME OF THE MORE INTERESTING LITERATURE RELATING TO PHARMACY AND MATERIA MEDICA.

By M. I. Wilbert,
Apothecary at the German Hospital, Philadelphia.

In this country the interest in matters pharmaceutic appears to be about evenly divided between the pending warfare on nostrums and fraudulent proprietaries and current criticisms on the recently issued revision of the U.S.P.

American pharmacists, and particularly the editors and owners of American pharmaceutical and drug journals, have not taken the prominent part in the present efforts to eliminate charlatanry and fraud from the practice of pharmacy that might, very properly, have been expected. This is all the more unfortunate in that pharmacists, as a class, should, above all others, be cognizant of the very grave possibilities for harm that are embodied in the several nostrums that are daily advertised and sold to the laity.

If the pharmacist of to-day has any possible excuse for his existence it is in this that he is supposed to be capable of differentiating the good from the bad, in medicine, and is thus in a position to point out to his customers, or to physicians, the shortcomings and the faults of supposedly new remedies or popular panaceas.

If then the pharmacist fails to take advantage of any or all opportunities that are offered him to make public his knowledge regarding the proper status of these several preparations, or, even worse, if he should fail to properly acquaint himself in regard to the truth or the falsity of the various claims and statements that are made regarding them, he is distinctly negligent in fulfilling his evident duties to himself and to the community and is certainly not deserving of the confidence and the patronage for which he is making a bid.

That harmful and fraudulent nostrums are being advertised and sold is admitted by all who have given the matter even cursory attention. It, therefore, appears to be particularly unfortunate that even a limited number of the pharmaceutical and drug journals of this country have been so remiss in appreciating the evident necessity of the hour as to not alone ignore the questions really at issue, but, even worse, to condone the shortcomings and the faults of some of these evidently fraudulent nostrums, because the proprietors or their

agents are supposed to have made sundry concessions to better the financial prospects of the retail pharmacist, whereas, in reality, these supposed concessions have been made, practically under compulsion, in a frantic endeavor to protect the nostrums themselves.

Proprietary Medicine Label Bills.—The most evident as well as the most direct outcome of the present attacks on fraudulent nostrums is to be found in the proprietary medicine label bills, similar to the one enacted in North Dakota last year, that have been introduced in a number of State Legislatures. A bill of this nature, that has been introduced into the Legislature of the State of New York, is said to have the endorsement of a number of prominent citizens of New York City as well as other sections of the State.

This proposed New York law requires that proprietary or patent medicines containing alcohol or any hypnotic, anesthetic, analgesic or cardiac, circulatory, respiratory or nerve depressant, have plainly displayed a true statement of the percentage of alcohol and the proportion of active drugs that would properly come under any one of the specified headings.

This same bill further provides for the analyses of suspicious preparations, and also provides a series of penalties for the violation of any or all of the provisions of the proposed law.

The Formula Bill proposed by Mr. Bok, in the February number of *The Ladies' Home Journal*, is much more drastic in character and provides that the label of all of the so-called patent medicines shall contain, in letters of a specified size, a complete and true schedule of all of the ingredients and their exact proportions.

That considerable legislation along these lines may be expected in the course of the next year or two is evidenced by the attitude that has been assumed by the members of the Proprietary Association of America, who, at their semi-annual meeting, in New York, last December, resolved that their legislative committee be instructed "to advocate legislation which shall prevent the use of alcohol in proprietary medicines for internal use, in excess of the amount necessary as a solvent and preservative." The legislative committee was further instructed to continue their efforts in behalf of legislation to restrict and to control the sale of cocaine and of other narcotics and poisons or medicinal preparations containing the same.

With the manufacturers of proprietary medicines themselves arrayed in favor of this particular type of legislation it would be

surprising indeed if the annual crop of formula bills did not exceed all previous records and if some of them, at least, were not enacted into laws.

The sale of intoxicating proprietaries is being rapidly restricted under existing laws, and it is quite probable that after April the 1st, when the previously announced ruling of the Commissioner of Internal Revenue, Mr. Yerkes, finally goes into effect, many if not all of the States will have made provision for further restricting the sale of such preparations. The liquor license laws of a number of States will probably require that pharmacists who desire to sell proprietary medicines that have been classed as being alcoholic, must secure not alone a United States license, but also a State, county and city permit or license. Action along these lines has even now been taken by the States of New York, Ohio, Missouri, Arkansas and Georgia.

The Council on Pharmacy and Chemistry of the American Medical Association is attracting considerable attention on the part of medical societies, in various sections of the country. Quite a number of local or county societies have endorsed the work that has been outlined for the council, and have further requested their individual members to favor publicity and honesty in all that pertains to medicines and medicinal preparations.

American Medicine for Honesty in Pharmacy.—By far the most encouraging sign of the times is the action that was taken by the stockholders of *American Medicine* at the recent annual meeting; in instructing the management of the journal to adopt, so soon as possible, a standard for advertising "as high as that of the Council on Pharmacy and Chemistry of the American Medical Association," and to reject any and all advertising which shall not come up to the adopted standard. (*Am. Med.*, February 17th, page 224.)

This action on the part of the stocholders of this particular journal is all the more important in that every holder was necessarily aware of the fact that such action would certainly entail serious personal loss, and might possibly involve the very existence of the journal itself.

Prescribing of Proprietaries.—From an editorial in the *American Druggist* (February 12, 1906, page 59) we would be led to believe that, contrary to all reasonable expectations, the crusade of the American Medical Association against objectionable proprietary

compounds has actually resulted in a marked increase in the use of these preparations by physicians during the past year.

The results of the canvass made by the *American Druggist* may be misleading, however, in that the conclusions were arrived at prematurely. At all events, it will be safe to withhold our final decision until after the present efforts have been given a reasonable time in which to demonstrate their efficiency or lack of efficiency.

Popularizing the Pharmacopœia with Physicians.—It has been repeatedly asserted that much of the present-day popularity of proprietary medicines is directly due to the fact that physicians have little or no knowledge of the Pharmacopœia and its contents, and that no consistent attempt has ever been made to bring the various drugs and preparations of the Pharmacopœia prominently before the medical practitioners of the country.

This shortcoming is being guarded against, in a measure, at the present time, and a number of ways and means of popularizing the recent revision of the Pharmacopœia are being tried. Not the least pretentious of these is the plan that has been adopted by the *Journal of the American Medical Association* in its current numbers. This journal is now printing a series of special articles designated "The Physician and the Pharmacopœia" that are designed to arouse the interest of medical practitioners in the various uses of the several official substances and preparations and incidentally at least to point out the advisability of adhering more closely to pharmacopœial preparations.

Pharmacists, if they were so inclined, could readily take advantage of this series of articles, and by bringing them more directly to the attention of physicians in their immediate neighborhood, or by demonstrating the elegance or desirability of pharmacopœial or N.F. preparations, would probably be able to convince a number of physicians that there is in reality absolutely no need for the present widespread use of proprietary remedies, particularly simple mixtures.

Another very promising plan for popularizing official preparations is that adopted by the druggists of Dallas, Tex., who, under the very able leadership of Prof. E. G. Eberle, have induced local physicians to meet and listen to descriptions or talks on the new Pharmacopœia and its contents. There are so many reasons to advance in favor of a more strict adherence to well-known or widely used reme-

dies that even a simple enumeration of them would be too extensive to attempt at this time; the single matter of international standards alone should prove to offer strong argument.

The advantages that must necessarily accrue from the now generally adopted standards for potent medicaments should necessarily appeal to every reader of medical journals, and a physician who does not read medical journals is, of course, absolutely hopeless. This is all the more evident when we remember that despite their general antiquity the potent remedies that were endorsed by the International Conference at Brussels in 1902 are in reality the most widely used as well as the most generally reliable medicaments now available.

It should not be forgotten, of course, that many pharmacists have already done good service in this connection by bringing the changes in the present edition of the U.S.P. to the attention of physicians, but, this is only a feeble beginning and unless it is followed up frequently and persistently by word of mouth and by actual demonstration it will be of little avail.

With a view of bringing the U.S.P. more directly to the attention of medical students the Board of Trustees of the Committee on Revision have decided to present the professors of materia medica in medical colleges with complimentary copies of that book. This seemingly trivial outlay should be of great value to American pharmacy, as it will, no doubt, tend to familiarize future generations of medical men with the fact that such a book as a Pharmacopœia of the United States actually exists, that it is periodically revised, and that, all in all, it may safely be considered as the standard for reliable and efficient medication.

Spanish Edition of the U.S.P.—This desirable innovation was also definitely decided on at the meeting of the Board of Trustees of the U.S.P., held in Pittsburg, December 2, 1905. A committee consisting of Prof. J. P. Remington, Chas. E. Dohme and Dr. H. C. Wood, was appointed to make preliminary arrangements for an edition of 2,000 copies. Of the foreign pharmacopœias that are now undergoing revision the French Codex and the Swiss Pharmacopœia are announced as being in press, and will probably be issued in the course of the next year.

The New Spanish Pharmacopœia.—A recently published review of the Spanish Pharmacopœia (*Phar. Zeit'g.*, 1905, page 1060) con-

adopted as the national standards, while the remaining will be included in an appendix at the end of the book.

The Bulletin of the A.Ph.A.—The initial number of the *Bulletin* of the American Pharmaceutical Association made its appearance with the advent of the new year, and is generally considered as being a thoroughly creditable as well as a readable pamphlet.

The title-page is headed by the suggestive and evidently opportune motto "Pharmacia Vera Prevalebit." While this is undoubtedly true of true pharmacy we trust that it will also prove true of the *Bulletin.*

This initial number, in addition to a salutatory by the editor, Prof. C. S. N. Hallberg, contains the annual address of the president and also a number of reports of committees that are of current interest.

The second number of the *Bulletin* is, if anything, even more interesting than the first in that it contains an exhaustive account of the very interesting and highly important meetings of the Section on Education and Legislation, at Atlantic City, in September, 1905.

Ten Years of Electro-Chemistry at Niagara Falls.—The *Journal of the Franklin Institute* (Jan., 1906, page 42) gives a resumé of the progress that has been made in the electro-chemical industry at Niagara Falls. On October 19, 1895, the current was turned on at the plant of the Carborundum Company, the first to use electric power at this point. At the present time more than a dozen electro-chemical industries are flourishing within a radius of two miles of the Falls.

The list of products alone is an imposing one, while their economic value represents an annual total of many millions of dollars. Of the products that are more directly of interest to pharmacists we may enumerate: Aluminum, aluminum hydrate, phosphorus, sodium, potassium, sodium hydrate, sodium dioxide, potassium hydrate, calcium carbide, chlorinated lime, chlorine, potassium chlorate, sodium chlorate, hydrochloric acid and vanillin.

The Production of Borax in the United States.—All of the output of borax in the United States comes from California and the larger part of that from the Colemanite deposits in San Bernardino County.

The total product for the year 1904 amounted to 45,647 tons crude, valued at $698,810. Of this amount 38,000 tons, valued at $508,000, came from San Bernardino County, Cal., the remainder coming from Ventura and Inyo Counties.

The total imports of borax, borates and boric acid, for the same year amounted to 476 tons, valued at $44,857. (*Jour. Franklin Inst.*, Jan., 1906, page 69.)

The Production of Bromine in the United States.—American bromine is obtained chiefly from the salt brines of Michigan, West Virginia, Ohio, and Pennsylvania. The manufacture of bromine in the United States was begun in 1846, at Freeport, Pa., but subsequently has been carried on chiefly in certain areas of brine production which are mainly at or near Lake St. Louis, Mich.; Pomeroy, O.; and Malden, W. Va. To produce bromine the residual liquids or bitterns from the processes of salt manufacture are treated with sulphuric acid, thus forming hydrobromic acid. From this the bromine is separated by the use of an oxidizing agent which removes the hydrogen. For this purpose either chlorate of potash or binoxide of manganese is used. The total output of American bromine in twenty-five years has been 10,499,625 pounds, valued approximately at $2,887,917. During 1904 the total output amounted to 897,000 pounds, valued at $269,130. (*Jour. Franklin Inst.*, Jan., 1906, page 70.)

Cinchona.—Mr. David Howard, in a recent address before the Society of Chemical Industry, gave a very interesting review of the history of cinchona and its cultivation. He said, among others, that owing largely to the elimination of all other species except Ledgeriana the average content of quinine in cinchona has been raised to upwards of 5·5 per cent., that bark containing upwards of 10 per cent. of alkaloid is now common enough, and that 15 per cent. and even more is frequently met with. The average prices for cinchona in 1905 were the lowest since 1899.

Java Cinchona.—From a review of the Java cinchona cultivation it appears that there are seventy-five limited companies and six private undertakings at work in the Island. The majority of these companies have so far not been able to pay any dividends, while some pay well, and one, the "Gabes" Company, has paid as high as 200 per cent.

The production of cinchona in Java has increased from 4,000,000 kilos in 1897 to 7,225,000 kilos in 1904, while in other producing countries the production has decreased from 2,000,000 kilos in 1898 to 705,000 kilos in 1904. (*Chem. and Drug.*, January 13, 1906, page 68.)

The Preservation of Medicinal and Chemical Properties.—Mr. F. A. Upsher-Smith reviews the methods that have been suggested from time to time to prevent the decomposition of liquid preparations.

With few exceptions it may be taken as a rule that all medicinal and chemical substances should be stored in a cool place, protected from light, in well-closed bottles. Protection from light, *i. e.*, chemical or actinic rays of light, whether their source is the sun or artificial, is attainable by the use of amber glass bottles. Mr. Smith believes that the use of preservatives should be discouraged in official pharmacy. (*Chem. and Drug.*, January 13, 1906, page 56.)

Acetanilid in Bromo-Seltzer.—It is not generally known that bromo-seltzer is in reality one of the numerous acetanilid mixtures that are now so widely exploited and used as panaceas for all sorts and kinds of pain. According to the *Journal of the American Medical Association* (February 10, 1906, page 454) this preparation contains as its active constituents: potassium bromide, 10·53 parts; acetanilid, 4·58 parts, and caffeine, 1·20 parts. Or, that the advertised dose, 5·0 grammes, contains, approximately, potassium bromide, 0·5 gramme; acetanilid, 0·2 gramme, and caffeine, 0·05 gramme.

Alcho.—This is the proprietary name that has been given to a basic aluminum carbonate that occurs as an amorphous powder, insoluble in water, alcohol or ether. Alcho has been recommended as an efficient local disinfectant and astringent. (*Apothek. Zeit'g.*, 1905, page 1003.)

Artificial Albumin.—Emil Fisher, Professor of Chemistry at Berlin, announced in an address held in Berlin on January 6, 1906, that he had succeeded in blending together certain amino acids resulting in compounds that possess properties which correspond closely to those of the peptones. These compounds, which he calls peptids, are optically inactive like the natural proteins. The more complicated peptids, it is asserted, closely resemble natural albumin in their various properties. (*Jour. Am. Med. Assoc.*, February 10, 1906, page 443.)

Barutine.—Barutine is a compound of barium and theobromine, which combines the physiological diuretic properties of theobromine with those of barium in increasing the blood pressure. The toxicity of barutine is said to be much less than that of a corresponding quantity of barium chlorides. In affections of the heart or kidneys it is

prescribed in a 1·25 per cent. aqueous solution, of which the dose is a tablespoonful three times a day. (*Phar. Jour.*, January 20, 1906, page 59, from *Nouv. Rem.*)

Chloroform Solutions of Iodine.—Chassevault (*Presse Med.*, 1905, page 845) recommends the use of a solution of iodine in chloroform in the place of the usual tincture of iodine, for external application.

Histosan.—This is said to be a chemical combination of albumin with guaiacol. It occurs as a light-brown powder, having a slightly aromatic taste and smell. It is nearly, if not quite, insoluble in water, alcohol or ether, but is readily dissolved by weak solutions of the alkalies. Histosin has been recommended as being indicated in cases of tuberculosis, also in diarrhœa. Dose for adults, 0·5 gramme, three times a day. (*Apoth. Zeit'g.*, 1905, page 919.)

Nitron.—This is said to be a sensitive and reliable reagent for nitrates in aqueous solutions. Chemically it is described as diphenyl- endalino- dihydro triazol. It is claimed that nitron will positively indicate nitric acid in a dilution of $\frac{1}{80000}$. As a reagent a 10 per cent. solution of nitron, in 5 per cent. acetic acid, is used. To 5 or 6 c.c. of the suspected water add 1 drop of diluted sulphuric acid and from 6 to 8 drops of the nitron solution. If there is an immediate turbidity or if within one or two minutes glistening needle-shaped crystals separate out from the solution, the water contains more than 100 milligrammes of N_2O_5 in each liter. If within half an hour no precipitate is produced, the water contains less than 25 milligrammes of N_2O_5 in each liter.

Nitron may also be used for the gravimetric estimation of nitrates. (*Phar. Post*, 1905, page 781.)

Proponal—Dipropyl barbituric acid is a homologue of veronal in which the two ethyl groups are replaced by two propyl groups. Proponal is a colorless crystalline substance that melts at 145° C. and is soluble in about 70 parts of boiling water and in about 1640 parts of cold water, but is readily soluble in dilute solutions of the alkalies. It is said to be more active than veronal, and is given in doses of 0·15 to 0·5 grammes. (*Apoth Zeit.*, 1905, page 1001.)

Protosal.—The salicylic ester of glycerin formaldehyde occurs as a colorless oily liquid that has a specific gravity of 1·344 at 15° C. It is freely soluble in alcohol, chloroform or castor oil, and is to be used externally, as an embrocation, in rheumatic affections. (*Phar. Zeit.*, 1905, page 1044.)

Santyl.—This is described as being the salicylic acid ester of santalol, and occurs as a light yellow, nearly odorless and tasteless, oily liquid that is insoluble in water, but readily soluble in alcohol or in ether. Santyl may be given in place of santalol or oil of santalwood in doses of 1 or 2 c.c. (*Apoth. Zeit.*, 1905, page 964.)

Zymphene.—Sodium metaoxycyanocinnamate occurs as yellowish crystals that are soluble in water and in alcohol. It has been recommended as being a tonic and digestive stimulant in cases of loss of appetite due to digestive derangement or other causes. It is given in doses of 0·5 gramme, and is stated to be non-toxic and antiseptic. (*Phar. Jour.*, Jan. 13, 1906, page 50.)

THE USE OF METALLIC COPPER FOR THE PURIFICATION OF DRINKING WATER.[1]

By Prof. Henry Kraemer, Philadelphia.

Before giving the results of my experiments with copper foil in destroying certain intestinal organisms, I desire to give some general observations with regard to the use of copper in the purification of water supplies, as the subject presents itself to me.

What I wish to bring out is that there appear to be distinct uses for copper foil and for copper sulphate or the salts of copper, and also that there is a proper time and place for the use of these.

Copper foil seems better adapted for use in the average household, and may be used when the drinking water supplied to a community is a diluted sewage, as it is in a number of places.

Salts of copper seem better adapted for disinfecting the discharges of typhoid patients, treatment of sewage, and the purification of contaminated water in reservoirs.

Theoretically, there should be no need of treating either the water in a reservoir (except where there is algal growth) or that which is supplied the householder from the city supply, except when there is contamination as a result of accident, as sometimes happens, granting that the sources of contamination have been properly safeguarded.

The discharges from typhoid patients being the source of the dis-

[1] Reprinted from the *Journal of the New England Water Works Association*, Vol. XIX, No. 4, p. 487.

ease, it is obvious that the disinfection with copper sulphate should begin here, and physicians should give instructions accordingly. If universal attention were given to this matter, there can be little doubt that the spread of typhoid fever would be prevented almost entirely. But as the matter cannot be absolutely controlled, the next best thing is to *disinfect the sewage.*

That certain organisms manifest a specific sensitiveness towards copper was first pointed out by Naegeli. Following the lead of Naegeli, Israel and Klingmann (1897) showed that copper foil has a marked toxic effect on certain bacteria, as *Bacillus coli* and the organisms producing typhoid fever and cholera. To Moore and Kellerman (1904) belongs the credit of first showing the application of the results obtained by Naegeli (on algæ) and Israel and Klingmann (on bacteria) in the purification of water supplies.

As the methods used in my work have been published and are readily accessible, it will probably be sufficient to call attention to some of the main features of the work.

(1) The copper used was in the form of sheet copper or copper foil, pieces approximating 9 centimeters square being used to each 1,000 c.c. of water.

(2) The organisms upon which we experimented were *Bacillus coli* and *Bacillus typhi,* twenty-four-hour bouillon cultures being used.

(3) The water used in the experiments included filtered, distilled and tap water, all of which were sterilized in an autoclave prior to adding the cultures and copper foil.

We found in nearly every experiment which we conducted that in the water containing the typhoid or colon organisms, and to which the copper foil was added, these organisms were destroyed in from two to four hours.

We also found in the parallel experiments which we conducted that in the water to which copper foil was not added, the typhoid and colon bacilli continued to grow and even multiply for months, except in the case of water filtered by means of a filter attached to an ordinary copper faucet. In the latter instance the typhoid organisms were destroyed in two to four hours, just as though copper had been added to the water, whereas the colon bacilli continued to grow, but not as rapidly as in distilled or tap water. This peculiar inhibiting action of the filtered water we subsequently proved was due to a property acquired by the water in its slow passage through

the copper spigot to which the filter was attached. That the inhibiting action of the filtered water was due to its contact with the copper spigot is shown by the fact that when we used a filter in which contact with copper was avoided, the typhoid organisms continued to grow the same as in distilled and tap water.

Later experiments showed that contact of the copper foil with the water for a very brief period of time was sufficient to affect these organisms. We found, for instance, that if the copper foil were allowed to remain in distilled water for one to five minutes, the typhoid organisms were completely destroyed within a few hours.

In a paper presented to the American Philosophical Society, the results of my work along this line are summarized as follows:

Certain intestinal bacteria like colon and typhoid are completely destroyed by placing clean copper foil in water containing them, or by adding the organisms to water previously in contact with copper foil.

The toxicity of water to which either copper coins or copper foil has been added is probably due to a solution of some salt of copper, as first suggested by Naegeli.

The copper is probably in the form of a crystalloid rather than that of a colloid, as it has the property of permeating the cell walls and organized cell contents of both animals and plants, thereby producing the toxic effects.

While the effects produced by the oligodynamic action of copper are apparently different from those of true chemical poisons, the difference is probably in degree only and not in kind.

Certain lower organisms, including both plants and animals, possess a specific sensitiveness to minute quantities of copper, and it has been shown that they are not restored on transferring them to water free from oligodynamic properties.

Oligodynamic solutions of copper are obtained by adding either copper coins, copper foil, or salts of copper to water; when copper foil is used, sufficient copper is dissolved by the distilled water in one to five minutes to kill the typhoid organisms within two hours.

A solution of copper may lose its toxicity by the precipitation of the copper as an *insoluble salt* or *compound;* by its *absorption* by *organic substances;* or by *adsorption* by *insoluble substances.*

The oligodynamic action of the copper is dependent upon temperature, as first pointed out by Israel and Klingmann.

The effects of oligodynamic copper in the purification of drinking water are in a quantitative sense much like those of filtration, only the organisms removed, like *Bacillus typhi* and *Bacillus coli*, are completely destroyed.

THE EFFECTS OF WATER TREATED WITH COPPER ON MAN.

While it has been conclusively shown that exceedingly minute quantities of copper are toxic to typhoid organisms, still the question is raised by some as to the toxic effects on man when copper or its salts are used in the purification of drinking water. In commenting on a paper of mine on "The Efficiency of Copper Foil in Destroying Typhoid and Colon Bacilli in Water," a reviewer writes as follows: "While recommending the use of copper foil for the purification of drinking water, the writer adduces no proofs as to freedom from toxic effects when water so purified is taken into the system over a considerable period of time." My reason for not taking up the pharmacological phase of this question heretofore has been that my own experiments in the consumption of water treated with copper foil did not extend over a sufficient period of time to warrant me in making any statements in regard to the effects of water so treated. Then, too, I felt that the statements of pharmacologists and physiologists were conclusive as to the probable harmlessness to man of copper when used in the proportions necessary to purify water containing typhoid organisms. But since there seems to be some objection in certain communities to the drinking of water treated with copper, I have deemed it advisable to give my own experience in connection with this subject.

For nearly a year all of the drinking water consumed in my home has been treated with copper. A strip of copper foil, or sheet copper, 9 inches square, is placed in a vessel containing from 3 to 4 quarts of water and allowed to remain from four to eight hours. The foil is first cleaned with powdered pumice, and retains its lustre for weeks unless the water contains a considerable quantity of sediment, and provided the quantity of water is renewed immediately each time upon drawing off the sterilized or purified water. On account of the varying amounts of sediment, we find it desirable to filter the water before treating it with copper foil. Up to this time no ill effects have been noted from drinking the water so treated, and, in fact, our general health may perhaps be said to be better

than usual, in that we have not had to consult a physician during this time. Another interesting observation is that the water being more palatable than boiled water, we consume larger quantities, which possibly has some influence on the general bodily condition.

Believing that many vegetables may also be a source of infection, we take the precaution either to wash the vegetables to be eaten raw with copper-treated water, or to place them, particularly in the case of lettuce and celery, in a vessel of water along with a strip of clean copper foil and allow them to remain from two to four hours with occasional agitation.

The use of copper vessels would be more convenient, but, of course, is more expensive. I have also thought that water pitchers and tumblers might be partly lined with copper foil.

From my own experience and observations, together with those of others, we may draw certain general conclusions, which I have summarized as follows:

It is pretty well established that the typhoid organism is disseminated not only through water, but also through air and food, and may retain its vitality for a considerable period of time.

Typhoid organisms in water are eliminated by filtration, boiling, and by certain biochemical methods. Of the latter, the use of copper, as proposed by Moore and Kellerman, is probably the most efficient and at the same time the most practicable.

While exceedingly minute quantities of copper in solution are toxic to certain unicellular organisms, as bacteria, it is safe to assume that the higher plants and animals, including man, are unaffected by solutions containing the same, or even larger amounts of copper.

There being a number of factors which tend to eliminate the copper in solution, it is hardly likely that there would be any copper in solution by the time the water from a reservoir reached the consumer if the treatment of the reservoir were in competent hands.

Many plants contain relatively large quantities of copper, and when these are used as food, some of the copper is taken up by the animal organism, but there are no records of any ill effects from copper so consumed.

SALE OF NARCOTICS AND OF PROPRIETARY MEDICINES CONTAINING ALCOHOL.

On December 27 and 28, 1905, upon the invitation of the Legislative Committee of the American Pharmaceutical Association, a conference was held at the Hotel Stratford in Chicago to consider legislation to regulate the sale of narcotics and proprietary compounds containing alcohol. There were present at this conference delegations representing the American Pharmaceutical Association, the Proprietary Association of America, the National Wholesale Druggists' Association and the National Association of Retail Druggists.

The delegates were not authorized to take final action as to any particular form of a law, but were merely appointed to confer together and refer back to the bodies which appointed them. There was considerable discussion, and the following was regarded as a good working basis for a discussion of possible laws to regulate the sale respectively of narcotics and of proprietary compounds containing alcohol.

ALBERT E. EBERT,
Of the American Pharmaceutical Association.
J. M. GOOD,
Of the National Association of Retail Druggists.
M. N. KLINE,
Of the National Wholesale Druggists' Association.
JOHN W. KENNEDY,
Of the Proprietary Association of America.

A BILL

To Provide Against the Evils Resulting from the Traffic in Certain Narcotic Drugs, and to Regulate the Sale Thereof.

Be it Enacted by the General Assembly of the State of _____.

SECTION 1. That it shall be unlawful for any person, firm or corporation to sell, furnish or give away any cocaine, alpha or beta eucaine, opium, morphine, heroin, chloral hydrate or any salt or compound of any of the foregoing substances, or any preparation or compound containing any of the foregoing substances, or their salts or compounds, except upon the original written order or prescription of a lawfully authorized practitioner of medicine, dentistry or veterinary medicine, which order or prescription shall be dated and

shall contain the name of the person for whom prescribed, or if ordered by a practitioner of veterinary medicine shall state the kind of animal for which ordered, and shall be signed by the person giving the prescription or order. Such written order or prescription shall be permanently retained on file by the person, firm or corporation who shall compound or dispense the articles ordered or prescribed, and it shall not be again compounded or dispensed, except upon the written order of the original prescriber for each and every subsequent compounding or dispensing. No copy or duplicate of such written order or prescription shall be made or delivered to any person, but the original shall at all times be open to inspection by the prescriber and properly authorized officers of the law.

Provided, however, that the above provisions shall not apply to preparations containing not more than 2 grains of opium or not more than ¼ grain of morphine, or not more than ¼ grain of heroin, or not more than ⅛ grain of cocaine, or not more than ⅛ grain of alpha or beta eucaine, or not more than 10 grains of chloral hydrate, in 1 fluid ounce; or if a solid preparation, in 1 avoirdupois ounce. Provided also that the above provisions shall not apply to preparations containing opium and recommended and sold in good faith for diarrhea and cholera, each bottle or package of which is accompanied by specific directions for use, and a caution against habitual use, nor to powder of ipecac and opium, commonly known as Dover's Powder, nor to liniments or ointments when plainly labeled "for external use only." And provided further that the above provision shall not apply to sales at wholesale by jobbers, wholesalers and manufacturers to retail druggists or qualified physicians, or to each other, nor to sales at retail by retail druggists to regular practitioners of medicine, dentistry or veterinary medicine, nor to sales made to manufacturers of proprietary or pharmaceutical preparations for use in the manufacture of such preparations, nor to sales to hospitals, colleges, scientific or public institutions.

SEC. 2. It shall be unlawful for any practitioner of medicine, dentistry or veterinary medicine to furnish to or to prescribe for the use of any habitual user of the same any cocaine, heroin, alpha or beta eucaine, opium, morphine, chloral hydrate, or any salt or compound of any of the foregoing substances, or any preparation containing any of the foregoing substances or their salts or compounds. And it shall also be unlawful for any practitioner of dentistry to

prescribe any of the foregoing substances for any person not under his treatment in the regular practice of his profession, or for any practitioner of veterinary medicine to prescribe any of the foregoing substances for the use of any human being.

Provided, however, that the provisions of this section shall not be construed to prevent any lawfully authorized practitioner of medicine from furnishing or prescribing in good faith for the use of any habitual user of narcotic drugs who is under his professional care such substances as he may deem necessary for their treatment, when such prescriptions are not given or substances furnished for the purpose of evading the provisions of this act.

SEC. 3. Any person who shall violate any of the provisions of this act shall be deemed guilty of a misdemeanor, and upon conviction for the first offence shall be fined not less than $25 nor more than $50, and upon conviction for a second offence shall be fined not less than $50 nor more than $100, and upon conviction for a subsequent offence shall be fined not less than $100 nor more than $200, and shall be imprisoned in the county jail for not more than six months and if a licensed pharmacist, physician, dentist or veterinary surgeon, his license shall be revoked. It shall be the duty under this act of all judges of the Courts of Common Pleas in this State, at every regular term thereof, to charge all regularly impaneled grand juries to diligently inquire into and investigate all cases of the violation of the provisions of this act and to make a true presentment of all persons guilty of such violations. It shall be the duty of the Board of Pharmacy to cause the prosecution of all persons violating the provisions of this act. No prosecution shall be brought for the sale of any patent or proprietary medicine containing any of the drugs or preparations hereinbefore mentioned until the Board of Pharmacy shall certify that such medicine contains any of the said drugs or preparations in excess of the maximum percentages hereinbefore mentioned.

SEC. 4. In any proceedings under the provisions of this act the charge may be brought against any or all of the members of a partnership, or against the directors or executive officers of a corporation, or against the agent of any person, partnership or corporation.

SEC. 5. All laws and parts of laws in conflict with this act are hereby repealed.

SEC. 6. This act shall take effect and be in force from and after the day of 19 .

A BILL

To Regulate the Sale of Certain Proprietary Medicines.

Be it Enacted, etc.

SECTION 1. Any proprietary medicine which contains a percentage of alcohol greater than is reasonably necessary for the extraction and dissolving of the active constituents of the drugs used in the preparation of said medicine or to prevent the precipitation of such active constituents or to preserve the medicine from fermentation or freezing, shall be deemed to be an intoxicating liquor and shall be sold only under the provisions of the law regulating the sale of intoxicating liquors. Provided that this act shall not be construed to apply to preparations compounded according to any formula embraced in the United States Pharmacopœia or the National Formulary, when sold under a title recognized by the said United States Pharmacopœia, or National Formulary.

SEC. 2. No prosecution shall be brought for the sale of any proprietary preparation in violation of the provisions of this act unless the Board of Pharmacy shall, after due investigation, certify that such proprietary preparation contains alcohol in a percentage greater than the limit fixed by Section 1.

BOOK REVIEWS.

BIBLIOGRAPHICAL INDEX OF NORTH AMERICAN FUNGI. By William G. Farlow. Volume I, Part I. Abrothallus to Badhamia. Issued September 1, 1905. Published by the Carnegie Institution of Washington. 1905.

One of the great needs of the scientific investigator is that of bibliographic compilations which will enable him readily to look up the literature bearing on the research problems which engage his attention. Most investigators probably spend as much time in looking up references and going over literature as they do in their actual research work. Therefore a work so complete as this Index is very welcome.

This stupendous work by Professor Farlow, of which we now have the first part, has been in preparation for over thirty years. It is a summary of all the literature on systematic mycology, excluding that on bacteria and the saccharomycetes. The classification adopted

is based upon both the Sylloge of Saccardo and the Pflanzenfamilien of Engler and Prantl. With some exceptions, the author has adopted the principle of using the oldest specific name under which a species is described. About 150,000 references have been brought together in this work, and these, together with numerous cross-references, are arranged in alphabetical sequence. In many instances, particularly where the synonym is disputed or confused, the results of Dr. Farlow's studies of authentic specimens in conjunction with collateral reading are embodied in the form of notes under different genera and species.

Dr. Farlow is always interesting in what he has to say, but probably never more so than when treating of the subjects of nomenclature and taxonomy. Probably no one is so familiar with the literature of botany, especially that of the fungi, as Dr. Farlow, and no one is more capable of discerning the errors of authors and the fallacies of the different schools of botanists. For this reason his influence on botanical thought and work has been most beneficial. In the preface to the volume at hand Dr. Farlow shows the folly of attempting to make hard and fast rules in nomenclature. He says: "It is best not to make too violent attempts to interpret the older mycologists, but to be content with letting the dead bury their dead. The business of reviving corpses has been carried altogether too far in mycology. . . . At the Vienna Congress it was voted to accept a list of certain genera of spermaphytes whose names are to be retained regardless of strict priority. It is to be hoped that at the next Congress a similar list of cryptogams will be presented so that in the case of genera clearly defined and generally recognized under names in use for many years, they may be regarded as fixed and exempt from future changes on the ground of priority."

This Index will stand as a monument to the energy, patience and ability of Dr. Farlow, and it is fortunate that the Carnegie Institution is willing to undertake the publication of works of this kind.

PHARMACEUTICAL MEETING.

The regular monthly Pharmaceutical Meeting of the Philadelphia College of Pharmacy was held on Tuesday afternoon, February 20th, with Prof. Samuel P. Sadtler in the chair.

Prof. Virgil Coblentz, of the College of Pharmacy of the City of

New York, gave an address entitled "Comments on the Chemicals of the Eighth Decennial Revision of the U. S. Pharmacopœia," which will be published in full in a subsequent issue of this JOURNAL.

Dr. C. B. Lowe expressed himself as much pleased with the address and moved that a vote of thanks be tendered Professor Coblentz for presenting it, which motion was unanimously adopted.

Prof. Joseph P. Remington said that he was very glad that Professor Coblentz had explained in detail the work connected with the revision of that portion of the Pharmacopœia relating to inorganic chemicals, and said that he could testify to the great amount of work done by the committee having this work in charge. He said that commendations from all over the world, including those from the highest authorities, show this revision of the U. S. Pharmacopœia to be far ahead of any yet published. He then referred to the Digest of Criticisms which the Committee of Revision had compiled for the use of the members, and said that only about 2 per cent. of the criticisms made on the 1890 edition were found to have any value, the others showing for the most part merely differences of opinion. He expressed the hope that the criticisms on the eighth decennial revision would be of more value, and said that they will all be considered. Continuing, Professor Remington said that every change in the Pharmacopœia is likely to affect some one. In the first place, preparations must be made to conform to it, and this may involve some loss and trouble; then again, there are those who object to change, preferring to go on in the old way, and hence criticism is likely to arise. On the other hand, he said, it should be understood that the Pharmacopœia is a book of standards for medicines, and not for analytical chemists. He then referred to the rubric for chemicals, which he said had not been adversely criticized, and in this connection called attention to the great purity of the tartaric acid and sodium bicarbonate on the market (these containing from 99·5 to 99·9 per cent. of the pure chemical), offering in explanation of this the fact of the rivalry between the Cleveland and Royal baking-powder companies, each making a claim for the purity of their products. In concluding his remarks Professor Remington referred to the criticism that the Pharmacopœia is a manufacturers' book, and asked how it could be anything else when all of the chemicals are made by manufacturers and not by druggists themselves.

Professor Coblentz said with regard to the criticisms pertaining to

the inorganic chemicals of the 1890 edition that the most valuable were those made by the chairman of that committee. He spoke of the purity of the cream of tartar on the market and said that the product made by the trust required but little purification for standard purposes. Calling attention to the salicylates he said that bleaching with sulphurous acid gives them their very white appearance. Professor Coblentz stated that the Pharmacopœia does a great deal of good by compelling druggists to buy the better grades of chemicals. He recalled an instance where a manufacturer had failed to sell one grade of a certain chemical which was only one-half cent more per pound than an inferior grade. To illustrate further, he said that the purest zinc oxide manufactured goes to the manufacturers of paints rather than to druggists. Another example given was that of commercial sodium phosphate, which he said contained a large amount of arsenic, and yet some pharmacists prefer this to the purer article although there is not much difference in the price.

Prof. Clement B. Lowe read a paper on the "Doses in the U. S. Pharmacopœia," which will appear in a later issue of this JOURNAL.

In discussing the paper, M. I. Wilbert said that as generally understood an average dose means one that can be doubled, tripled, or quadrupled at the time, so that a low dose is desirable. Only in one or two instances did he consider the average doses as given in the Pharmacopœia to be high, and mentioned as one example that of acetanilid.

Dr. Lowe did not entirely coincide with this view of the question, and said that not only should the dose be taken into consideration, but also the question as to the length of time required for the elimination of the drug from the system.

M. I. Wilbert, Ph.M., presented a quarterly review of the advances in pharmacy. (See page 129.)

Professor Sadtler referred to the movement instituted by the *Ladies' Home Journal*, *Collier's Weekly*, and to the work of the Council on Medicine and Chemistry of the American Medical Association, and said that if the members of the Association continue to support it that the nostrum business will eventually be dissolved.

Professor Remington thought that the movement would lead to legislation compelling the printing of the formula on the label.

FLORENCE YAPLE,
Secretary pro tem.

NOTES AND NEWS.

BULLETIN OF THE AMERICAN PHARMACEUTICAL ASSOCIATION. — The Council of this Association has appropriated $500 for the publication of a monthly bulletin, the expenditure of the same to be under the direction of the editor, Prof. C. S. N. Hallberg. Two numbers of the *Bulletin* have thus far appeared. They contain the transactions of the last annual meeting and are printed from advance sheets of the annual report. In the editorial comment of the February issue attention is called to the first local branch of the Association, which was organized in Chicago on January 16th. The meeting was convened by Prof. Oscar Oldberg, Professor Hallberg acting as chairman. It is to be hoped that other local branches will be organized and that thus the interest in the work of the Association will be augmented, and that thereby the membership will be much increased. There is no reason why the Association should not number 5,000 members by 1910.

J. H. REDSECKER, of Lebanon, Pa., read an interesting paper before the Lebanon County Historical Society on "The Women's Aid Society of Lebanon During the War of the Rebellion," in which he stated that this society fed tens of thousands of soldiers on their way to the war, and rendered efficient aid to the Sanitary Commission and other similar organizations.

WILD MEDICINAL PLANTS OF THE UNITED STATES.—The Bureau of Plant Industry of the U. S. Department of Agriculture has recently issued a bulletin on this subject which was prepared by Miss Alice Henkel, Assistant in Drug Plant Investigations. The common and scientific names of the plants are given and also the localities in which they occur.

WILLIAM MCINTYRE was recently made chairman of a sub-committee of the Board of Public Education in Philadelphia, which has charge of the Municipal School Gardens. Miss Helen C. Bennett is the Supervisor of the Gardens, which were organized May 12, 1904.

PROF. H. H. RUSBY has been recently re-elected president of the Torrey Botanical Club, which is the oldest and probably the most influential organization of botanists in this country. It was through one of its members, Dr. Britton, that botany as a distinct department at Columbia University was developed, and later through him and other members of the club that the New York Botanical Garden, which is destined to become the "Kew Gardens of America," was organized.

THOMAS S. WIEGAND, Librarian of the Philadelphia College of Pharmacy, has just completed fifty years of active service in the college, and it is proposed to commemorate his service by the endowment of a scholarship to be known as the "Thomas S. Wiegand Scholarship." For this purpose it is proposed to collect a fund of $3,000 from the graduates of the college and friends of Mr. Wiegand. The trustees of this fund are Prof. Joseph P. Remington, President Howard B. French and George M. Beringer, the latter of whom is the treasurer of the committee and to whom subscriptions should be sent.